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The Education Papers

Stay in School:

New Lessons on the Benefits of Raising the Legal School-Leaving Age

Philip Oreopoulos

In this issue ...

High-school dropout rates remain disturbingly high in Canada. But is raising the minimum age for leaving school part of the solution? New evidence suggests that it is.

The Study in Brief

Too many, too soon: that is the common lament over Canada's disturbing high-school dropout rate. With one in five young adults lacking a high-school diploma, politicians and educators are looking for solutions. This paper examines one possible answer: raising the minimum school-leaving age above 16.

The paper presents new evidence from the United States and New Brunswick, which raised the age to 18 in 2000, for considering whether the other provinces should support and enforce an increase in the school-leaving age. First, the study examines broad data on school enrolment and attainment in these jurisdictions. The finding: partly as a result of weak enforcement, recent changes in the school-leaving age had only a small — but still significant — impact on school completion rates.

The study then delves deeper with a more systematic analysis, which isolates those students specifically affected by changes to the school-leaving age. Based on the results, the study estimates that raising the school-leaving age above 16:

- increases, on average, an individual's length of schooling by between 0.12 and 0.16 years;
- decreases the dropout rate by between 1.2 and 2.1 percentage points; and
- increases the fraction of young adults with at least some college or university by between 1.5 and 2.1 percentage points.

Raising school attainment alone, however, does not indicate successful policy. More important are the effects of raising the school-leaving age above 16 on early unemployment and earnings outcomes for those forced to stay in school longer. The results show that an additional year of compulsory schooling not only lowers the probability of being unemployed but also boosts weekly earnings.

This is the first study to look at the impact of measures raising the school-leaving age over the last 20- to 30-year period in North America. Its findings are in line with those of previous studies, which have dealt with increases in the minimum age that occurred in the early half of the 20th century.

The Author of This Issue

Philip Oreopoulos is Assistant Professor of Economics at the University of Toronto and Faculty Research Fellow with the National Bureau of Economic Research (NBER).

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The high-school dropout rate in Canada remains uncomfortably high. About 20 percent of Canadians in their twenties — one in five — have no secondary-school certificate and no postsecondary education of any kind.[1] The figure is disturbing because high-school dropouts fare much worse later in life compared to those who obtain more education. They earn, on average, less than high-school graduates and are more likely to be unemployed, draw on social assistance and other welfare programs, end up in jail and be in poorer health. If dropping out causes these bad outcomes, students that drift towards early exit in school stand much to gain from staying on instead.

Provincial education ministries have grappled with finding ways to reduce the number of dropouts. Some suggest lowering class size, others suggest making the curriculum easier, or trying to target at-risk students earlier. An additional possibility, also considered recently by several provinces, is to raise the minimum school-leaving age. This specifies the length of time students must spend in school before having the legal option to leave. Except for New Brunswick, all provinces mandate a minimum school-leaving age of 16. In Alberta, a private member's bill proposing to raise the age to 17 was legislated in 2003, but was never proclaimed (Red Deer Public Schools 2005). The Ontario government said in 2002 it planned to raise the age to 18. It reiterated that commitment in the fall 2005 Throne Speech and a policy announcement is expected very soon.

Support for increasing the school-leaving age often rests on paternalistic hunches that students wishing to leave school early are, in fact, better off if they decide to stay on. In 1998, for example, the Deputy Minister of Education for New Brunswick provided this explanation for the province's decision to raise the minimum school-leaving age to 18:

> "[E]ducators must help students fulfill the Mission of Public Education in New Brunswick to acquire the necessary skills, knowledge, and attributes needed to be a life-long learner, to achieve personal fulfillment and to contribute to a productive just and democratic society." (School-leaving Age Task Force 1998.)

And in Ontario, Premier Dalton McGuinty stated:

> "We've got a law on the books now that says that you can quit school when you're 16. Think about it. This is the knowledge economy — that no longer makes sense. So we're going to require that young people be in school or learning outside of school ... until they reach the age of 18." (National Post, September 28, 2002.)

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1 Twenty-seven percent of 22- to 24-year-olds in the 2001 Canadian Census had no secondary school certificate, down slightly from 29 percent in 1996 and 30 percent in 1991. Only 19 percent of these individuals take additional postsecondary schooling. There are several other ways to gauge high-school completion (see Kaufman, Alt and Chapman 2001). For example, event dropout rates indicate the percentage of students who dropped out of school over a relatively short period of time, often between one year and the next. The less time-sensitive status dropout rate measures the percentage of individuals who are not enroled in high school and who lack a high-school credential. Completion rates measure the percentage of a given population that has a high-school credential, regardless of when the credential was earned. Measures of completion vary depending on what age groups are included, since some individuals return later to complete a degree. Data on completion rates from the census and labour force survey seem most reliable to me, but most other measures produce similar trends and measures. Mainly for exposition, I shall refer to students who do not complete their secondary degree as dropouts. These figures are similar, whether looking at all 22- to 24-year-olds, or only Canadian-born.

But hunches aside, what do the lessons of experience have to say? The purpose of this paper is to present new evidence from New Brunswick and the United States for considering whether the provinces should support and enforce an increase in the legal school-leaving age.

The first part of the paper focuses on whether recent changes in laws to increase the minimum age in Canada and the U.S. had any impact on increasing school enrolment and attainment. Many of the revised laws included exceptions, were poorly enforced, or had little punishment for non-compliance. Partly as a result of weak enforcement, I find that recent increases in the school-leaving age had only a small — but still significant — impact on school completion rates.

Then I apply a more systematic analysis, with findings that lend further support to increasing the school-leaving age. Most interestingly, even though compulsory schooling laws do not mandate any postsecondary education, I find that raising the school-leaving age above 16 increases the fraction of youths with at least some college or university. One notion consistent with this finding is that some individuals compelled to stay longer in high school become more interested in postsecondary education, or view higher education as less daunting than when they were younger. The paper finally considers the employment benefits for students who extend their schooling under compulsion. I estimate the subsequent impact on earnings and employment for the small fraction of students specifically affected by increases in the school-leaving age and who stay in school longer as a result.

A word on methodology: My methodology (see Appendix B) takes into account changes in compulsory school laws in different states at different times. It allows us to estimate not only the overall impact of compulsory school-leaving laws, but also their impact on students specifically affected by them and who would have otherwise left school.

Without this methodology, it is hard to distinguish between the effect of staying in school beyond 16 and the effect of the underlying factors, such as motivation, that lead some teenagers to remain in school longer than others. For example, if we observe that someone who finished high school earns more than someone who didn't, is it because the individual stayed in school longer or is it because the individual is generally more motivated, which led him/her to stay in school longer, and work harder to earn more? If we don't take care to distinguish between the two possibilities, we might assign to extra schooling an advantage that really comes from individual characteristics that are independent of school policies.

The results of my analysis are very similar to older studies. I estimate that individuals compelled to stay in school beyond 16 experience significantly higher earnings and higher opportunities for employment in their early careers. Finding large labour-market gains for individuals forced to stay in school raises the question of why dropouts drop out in the first place. Why do young persons in Canada leave school early if staying on generates attractive gains, on average, to their careers and overall well-being? For dropouts to know what they are doing, they must really hate school to forgo the large expected returns from staying on. Alternatively, perhaps the reasons behind wanting to introduce compulsory schooling laws in the first place are correct: perhaps dropouts are myopic, or

underestimate the gains from school, or perhaps social pressures dominate their concerns. Whatever the reasons, one clear recommendation of this paper is that if provinces are serious about raising the school-leaving age, they need to effectively enforce these laws and promote their potential benefits to administrators, parents, and students.

Previous Studies

Previous studies have dealt with increases in the minimum school-leaving age that occurred in the early half of the 20th century. They have consistently found large gains to adult social-economic outcomes. For the United States, Angrist and Krueger (1991) and Acemoglu and Angrist (2001) estimated (using very different methodologies) that annual adult earnings are about 10 percent higher for students compelled to stay a year longer in school. For the United Kingdom, Harmon and Walker (1995) found about 14 percent higher earnings from such compulsory measures. And for Canada, I found similar gains, using provincial law changes between 1915 and 1970, for would-be-dropouts compelled to stay in school.

Other studies have examined the impact of compulsory schooling on non-pecuniary outcomes. Lochner and Moretti (2004) estimated that compulsory schooling lowers the likelihood of committing crime or ending up in jail. Lleras-Muney (2005) estimated an additional year of compulsory schooling substantially lowers the probability of dying sooner among elderly people. Black, Devereux, and Salvanes (2005) found compulsory schooling reduces the chances of teen pregnancy in the United States and Norway. And Oreopoulos, Page and Stevens (2003) conclude that parents with more compulsory schooling are also less likely to have children who have to repeat a grade or drop out themselves.

However, these earlier reports examine effects from raising the minimum school-leaving age to 14, 15, or 16 many decades ago, often before the 1950s. The circumstances behind dropout decisions back then were quite different than the circumstances behind dropout decisions today. The demand for skilled workers has increased, and the gains from additional education attainment may also have increased. On the other hand, more students today graduate from high school and obtain postsecondary education. Today's dropouts come from relatively poorer families. Based on the 2001 Census, 73 percent of dropouts under 20 and living at home have parents with household income below the 25th percentile, compared to 61 percent of dropouts from the 1981 census. It is not clear whether compelling these individuals to remain in school beyond 16 would generate the same effects found in earlier studies.

Ideally, we need to explore more recent changes. New Brunswick's change in the school-leaving age, from 16 to 18 in 2000, is almost too recent, since not enough time has elapsed to examine subsequent outcomes. Consequently, I look to the United States. Like provinces in Canada, many states in the U.S. have discussed raising the school-leaving age to 17 or 18, almost making high-school graduation compulsory. As of today, 29 states have already increased the minimum age above 16. Below, I use these recent changes to examine the potential for compulsory schooling to: 1. serve as an effective policy for reducing dropout

rates; and 2. improve subsequent social-economic outcomes. While using the same methodology as the earlier studies, this is the first study to look at measures over the last 20- to 30-year period that raised the minimum school-leaving age above 16.

Recent Changes to Compulsory Schooling Laws in the U.S. and Canada

As a first step, this section provides an overview of compulsory schooling laws in U.S. states, then in New Brunswick. It considers the extent to which the laws are enforced, and their impact, based on broad data on high-school enrolment and educational attainment for the relevant age groups.

The U.S. Experience

Many states in the U.S. have a minimum school-leaving age of 17 or 18. The National Center for Education Statistics' annual Education Digest lists these laws. Figure 1A shows the minimum school-leaving age between 1970 and 2003 for states that set the age above 16 at least once during this period (and for the District of Columbia). Figure 1B shows the other states.[2] Several, like Rhode Island, Florida, and Nebraska, upgraded their compulsory school laws only in the last few years. Others, like Oklahoma, Oregon, and Utah, however, have had a minimum-leaving age set above 16 for more than two decades.

The strange pattern shown by a few states, where the leaving age has been raised, then lowered, hints that more is going on. A closer look at the legislation reveals that there is much more to compulsory school laws than a specific age range within which individuals must remain in school. In several states, students can leave earlier than the legal minimum age if they work instead. In other cases, students can leave with parental consent. Kansas allows dropping out before the recorded minimum age if, after a counselling session, both student and parents sign a disclaimer. In doing so, they acknowledge a list of academic skills the student may not yet have acquired, and statistics on differences in average earnings and unemployment rates between dropouts and graduates.[3]

Some students disengage and drop out illegally because compulsory schooling policies are not well-enforced, or punishment for habitual truancy is not severe enough to deter them. Administrators may be reluctant to pursue court action, especially in cases where students are disruptive in class and do not appear interested in school. In virtually every state, the primary action when a student begins to disengage from school (through absenteeism) is to notify a parent or guardian and counsel him or her to encourage the child to attend. Some states require parents to pay fines or even face imprisonment for a child that regularly skips school. Children themselves can face termination of driving privileges (see Burke 2005), community service, or be forced to attend a juvenile detention facility.

2 Hawaii and Alaska are left out of this paper's analysis because student dropout trends in these states are less likely to follow trends in the rest of the country.

3 See Kansas State Department of Education (2005).

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Figure 1A: *States with Minimum School-Leaving Age Greater than 16 At Least Once, 1970 – 2003*

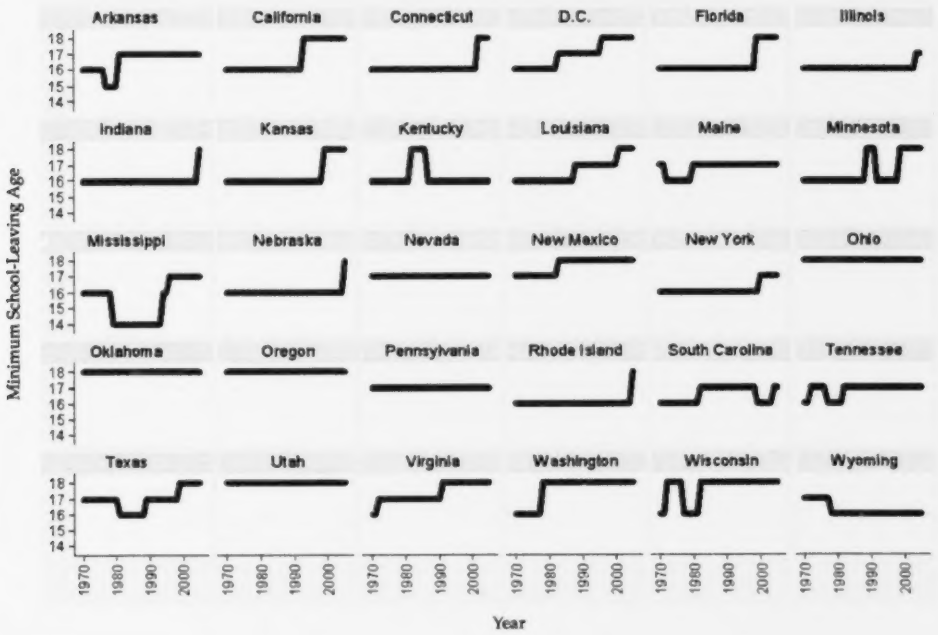


Figure 1B: *States with Minimum School-Leaving Age 16 or Less, 1970 – 2003*

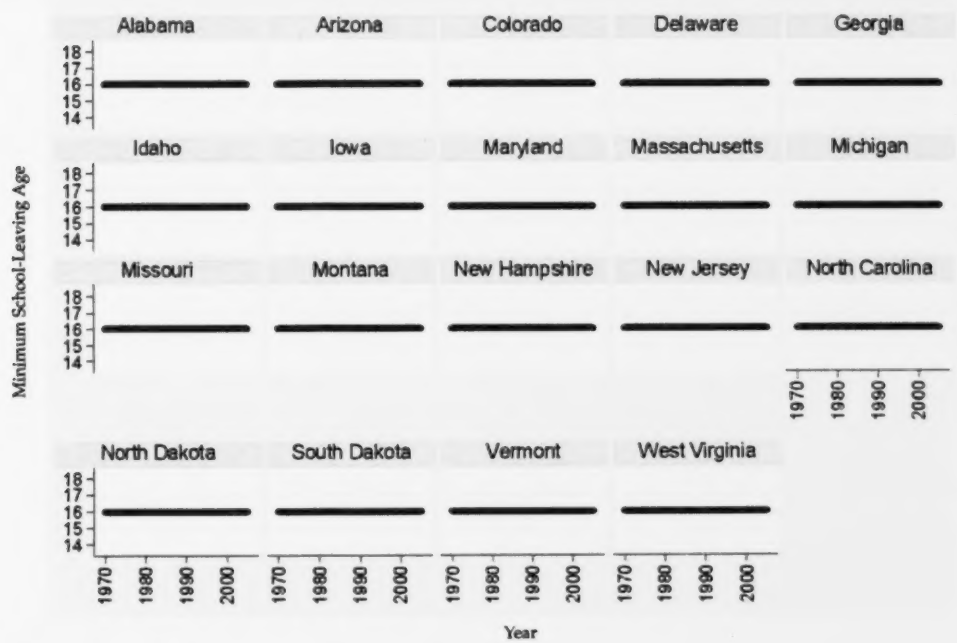


Table 1: *School Attainment by School-Leaving Age Faced at Age 16, 2000 – 2003*

	Legal School-Leaving Age Faced at Age 16		
	16	17	18
		%	
Fraction of 16-Year-Olds In School During School Year	96.20	95.65	96.63
Fraction of 17-Year-Olds In School During School Year	91.68	91.66	93.22
Fraction of 18-Year-Olds In School During School Year	73.42	73.64	74.73
Fraction of 20- to 24-Year-Olds with High School Degree or some Postsecondary	85.56	83.38	85.24
Fraction of 20- to 24-Year-Olds with some Postsecondary	51.55	48.55	52.14

Notes: Data are from the NBER's extracts of the Merged Outgoing Rotation Files of the Current Population Survey. The years included for this table are 2000 to 2003. The "in school" variable is coded as one if an individual is enrolled part-time or full-time in school the week of the survey.

In practice, only a fraction of habitually truant students are disciplined by the state. In Tennessee, for example, most attendance officers believe that their caseload is too large and that they face difficulty contacting the families of truant students (Palmisano and Potts 2004). Only general guidelines are provided by the state to determine habitual truancy, and schools have little financial incentive to improve attendance.

If the minimum school-leaving age affects at least some would-be dropouts, we might expect to observe more 16- and 17-year-olds in school in states that have legal leaving ages of 17 or 18, respectively, compared to states with a leaving age of 16. We also might expect that in states that provide no exceptions to a leaving age of 18, we should observe virtually all 16- and 17-year-olds in school.

To check these expectations, Table 1 presents the fraction of 16-, 17-, and 18-year-olds in school during the 2000 to 2003 school years. Results for each age group are categorized under the minimum-leaving age faced at age 16,[4] whether that be 16, 17 or 18.

Consider, first, the case of 16-year-old students. Most 16-year-olds are in school regardless of the minimum school-leaving age that exists, which might be expected. But contrary to expectations, students in states with a school-leaving age of 17 are slightly less likely to be enroled at 16, compared to students in states with a leaving age of 16 (95.7 percent versus 96.2 percent respectively). Yet, 16-year-olds in states with a school-leaving age of 18 are slightly more likely to be in school (96.6 percent).

The fraction of 17-year-olds in school by no means spikes up for youths in states with a school-leaving age of 18, as we might expect to see. Fully 6.8 percent

4 These proportions are calculated from responses in the 2000 to 2003 outgoing rotation files of the Current Population Survey, excluding the months of June, July and August and using population weights. I matched the state school leaving ages to the year in which an individual was 16 in their current state of residence. The data appendix provides additional details.

of 17-year-olds in states with a leaving age of 18 have left, which is comparable to 8.3 percent in states with a leaving age of 16.

Table 1 also presents education attainment measures for 20- to 24-year-olds. There are surprisingly no major differences in the dropout rate or postsecondary attainment rate across states with different leaving ages. One reason for this is that states that tend to have more restrictive compulsory schooling laws also perennially tend to have more students that drop out, regardless of legal stipulations. This limits our ability to observe the effects of these age limits. I address this in the next section. At the very least, the finding that many students leave before the legally mandated age suggests that exceptions, exemptions, and lack of enforcement of these laws weaken their effectiveness in keeping youths in school.

The New Brunswick Experience

The province of New Brunswick increased the school-leaving age to 18 in 2000. This was the first (and, so far, only) time any province raised the school-leaving age above 16. A task force in 1999 recommended the change, provided that programs were set up to address needs for students who would struggle to cope staying longer.[5] New services, including apprenticeships and tutoring programs, were introduced along with the new law.

The school-leaving age of 18, however, is not enforced. The Education Act of New Brunswick (2005) indicates that a parent who fails to 'cause' a frequently truant child to go back to school is subject to a misdemeanour charge, but only until that child is 16. There is no consequence listed in the Act associated with habitual truancy of children 16 years old or older.[6]

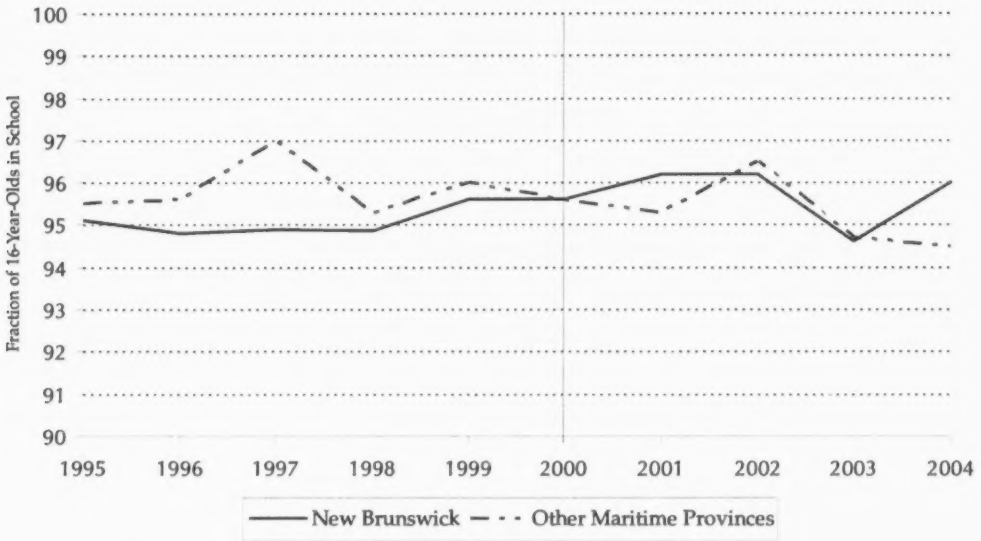
To examine whether the new law affected school enrolment, Figures 2A, 2B, and 2C plot the portion of teenagers in school full-time in New Brunswick and in the other Maritime Provinces (which have minimum school-leaving ages of 16) between 1995 and 2004. These data come from the monthly Labour Force Surveys.[7] Under the law change, we might expect to observe a jump in school enrolment among late teens in New Brunswick after 2000, but no such jump for late teens in the other provinces (Nova Scotia, Prince Edward Island, and Newfoundland). As with the U.S. comparison above, however, there is little difference between enrolment rates across the Maritimes. The fraction of 16-year-

5 See School Leaving Age Task Force (1998).

6 An article by Davis (2004) in the *New Brunswick Telegraph-Journal* notes: "A five-year-old law designed to keep New Brunswick teens in school until age 18 has never been enforced." She cites Robert Gerard, director of student services with the Department of Education as saying the law wasn't put in place to prosecute offenders or their parents. "It was part of a proactive approach the department took to ensure the needs of all students are met. Psychologically, it has made a difference for educators, parents and students. The mindset had to be changed of educators to recognize that the Department of Education and society was serious about the need to keep our children in school and make sure they have a sound education."

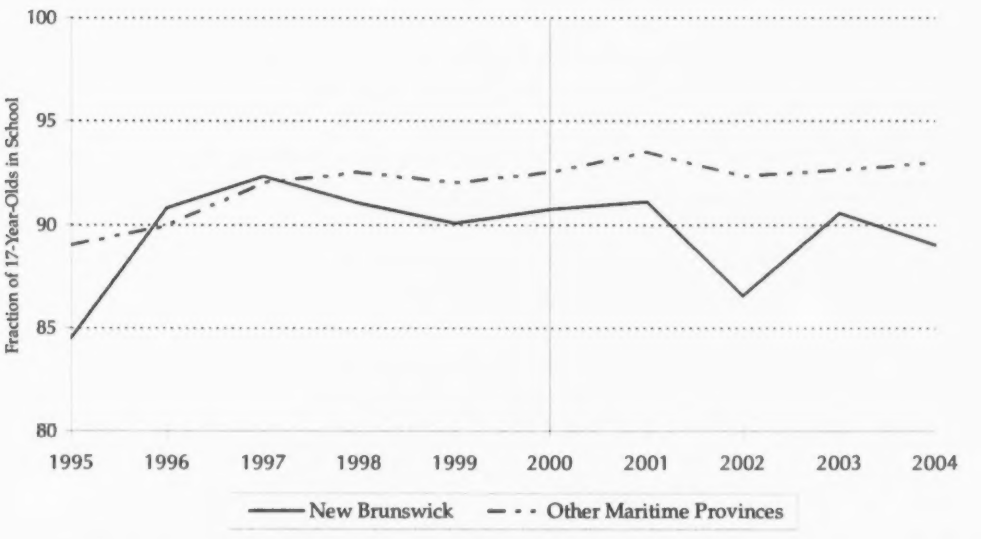
7 I use Statistics Canada's more detailed version that includes an individual's age, rather than age in the Public Use files. I combined the monthly surveys between 1995 and 2004, excluding the months between June and August. I use population weights to calculate the fraction of full-time students at different ages.

Figure 2A: *Fraction of Maritime 16-Year-Olds in School Full-Time, 1995 – 2004*



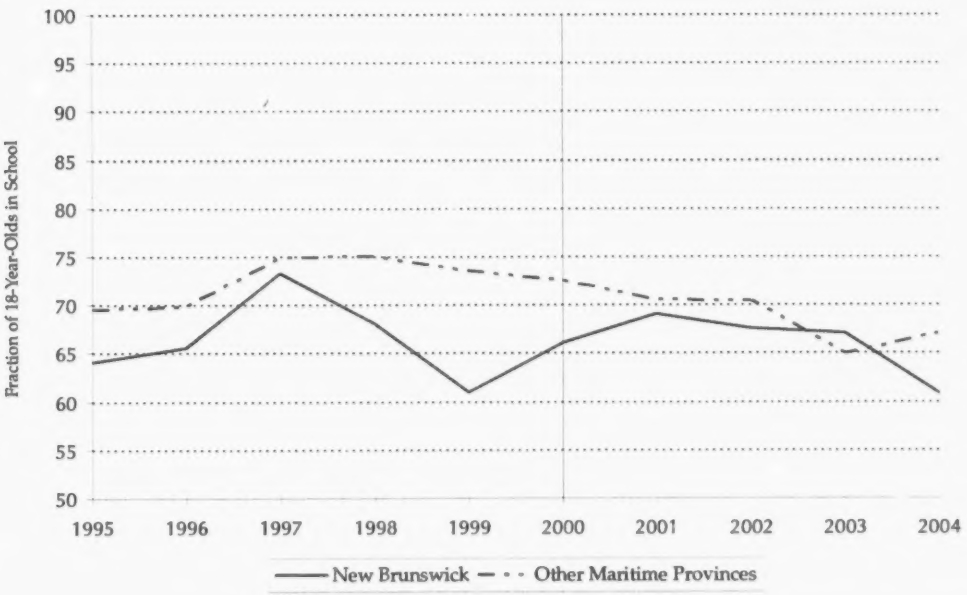
Note: Data are from the combined monthly Labour Force Surveys at Statistics Canada. Each plot indicates the fraction reported in school full-time for each survey year, excluding those in months June, July, and August. The vertical line in 2000 indicates the year in which New Brunswick raised the school-leaving age to 18.

Figure 2B: *Fraction of Maritime 17-Year-Olds in School Full-Time, 1995 – 2004*



Note: Data are from the combined monthly Labour Force Surveys at Statistics Canada. Each plot indicates the fraction reported in school full-time for each survey year, excluding those in months June, July, and August. The vertical line in 2000 indicates the year in which New Brunswick raised the school-leaving age to 18.

Figure 2C: *Fraction of Maritime 18-Year-Olds in School Full-Time, 1995 – 2004*



Note: Data are from the combined monthly Labour Force Surveys at Statistics Canada. Each plot indicates the fraction reported in school full-time for each survey year, excluding those in months June, July, and August. The vertical line in 2000 indicates the year in which New Brunswick raised the school-leaving age to 18.

olds in school stays relatively flat for all provinces, at about 96 percent. The fraction of 17-year-olds in school is also flat after 1998, at about 90 percent. The 17-year-old enrolment rate is slightly lower for New Brunswick, even though that province's law implies enrolment should be closer to 100 percent after 2000. We see no noticeable change at that time.[8]

A similar pattern holds when we look at educational attainment. The law change in New Brunswick is too recent to observe individuals older than 19 and exposed to the new law. But among 19-year-olds in 2004, 18.6 percent did not complete high school and did not take any postsecondary education. This compares to 19.7 percent for the other Maritime Provinces. In 2000, New Brunswick's dropout rate among 19-year-olds was also slightly smaller than for the other Maritime Provinces (22.6 percent versus 23.2 percent, respectively). Neither difference is statistically significant. In short, the increase in New Brunswick's school-leaving age appears to serve more as a signal by the province of its desire to encourage high-school graduation, but without a serious commitment to keeping every 16- and 17-year-old in school with appropriate enforcement.

8 The discrepancy in the difference between New Brunswick and other Maritime Provinces before and after 2000 is small and not statistically significant.

Delving Deeper: The Results of a More Systematic Analysis

The last section discussed how exceptions to, or weak enforcement of, the minimum school-leaving age can diminish its effectiveness in compelling students to stay. States with more restrictive laws do not have noticeably lower dropout rates or early exit rates than other states. These simple comparisons, however, may belie the true impact of compulsory measures if the same states with more restrictive laws also tend to have more students that leave school early for other reasons.

This section describes the results of a more systematic analysis of the effects of recent U.S. changes in school-leaving ages on school enrolment and attainment. I estimate that raising the school-leaving age above 16 is, in fact, associated with an increase in school attainment, albeit a small one.

The main analysis combines the monthly outgoing rotation files of the Current Population Survey (CPS) between 1979 and 2003. (Appendix A describes the data I use in more detail.) The Bureau of Labor Statistics uses the CPS to calculate unemployment rates in the United States. Each monthly survey includes about 30,000 nationally representative individuals, with information about their state of residence, labour force participation, weekly or hourly earnings, and educational attainment. To focus the analysis on the effects of recent changes to compulsory school laws, I limit the sample to individuals aged 20 to 24 between 1975 and 2003, matched to the school-leaving ages shown in Figures 1A and 1B for the years 1970 to 1995. Individuals are matched to the school-leaving age of their state of residence when they were 16 years old.[9]

Using regression analysis (see Appendix B), the first question I ask is: what is the effect on length of schooling when the minimum-leaving age is raised above 16? The analysis uses control variables for the effects of an individual's state of residence, birth cohort, and survey year. These variables control for perennial differences in state education attainment that do not vary over time, as well as national trends in education attainment that do vary over time. Controlling for such outside influences allows for a more precise estimation of the effects we are really interested in; that is, the effects of facing a minimum school-leaving age above 16 on different measures of educational attainment.

I estimate that, on average, raising the school-leaving age above 16 increases an individual's length of schooling by between 0.12 and 0.16 years, depending on what control variables are included in the analysis (detailed results are in Table B1 in Appendix B).

Next, I ask whether raising the school-leaving age influences high-school completion and postsecondary enrolment. This is a similar analysis, but I use high-school completion and postsecondary school enrolment as outcome variables instead of years of schooling. The results indicate that raising the school-leaving age above 16 decreases the dropout rate and increases college or university entrance.

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9 In this analysis, I include immigrants, since most 20-to 24-year-old immigrants likely faced compulsory schooling laws in the U.S. The results are similar excluding them, and available on request.

Again, depending on the specific set of control variables included in the analysis, raising the school-leaving age above 16 lowers the fraction of 20- to 24-year-olds who have never completed high school by between 1.2 and 2.1 percentage points. Even though compulsory schooling laws do not mandate any postsecondary education, I also find that raising the minimum age above 16 increases the fraction of young adults with at least some college or university by between 1.5 and 2.1 percentage points. One explanation consistent with this finding is that some individuals compelled to stay longer in high school become more interested in postsecondary education or view higher education as less daunting an obstacle than when they were younger.

As a check on these results, I perform the same analysis, but this time using the actual school-leaving age (16, 17, or 18) to categorize the results instead of the legal school-leaving age. The results are similar.

The evidence from the most recent cohorts

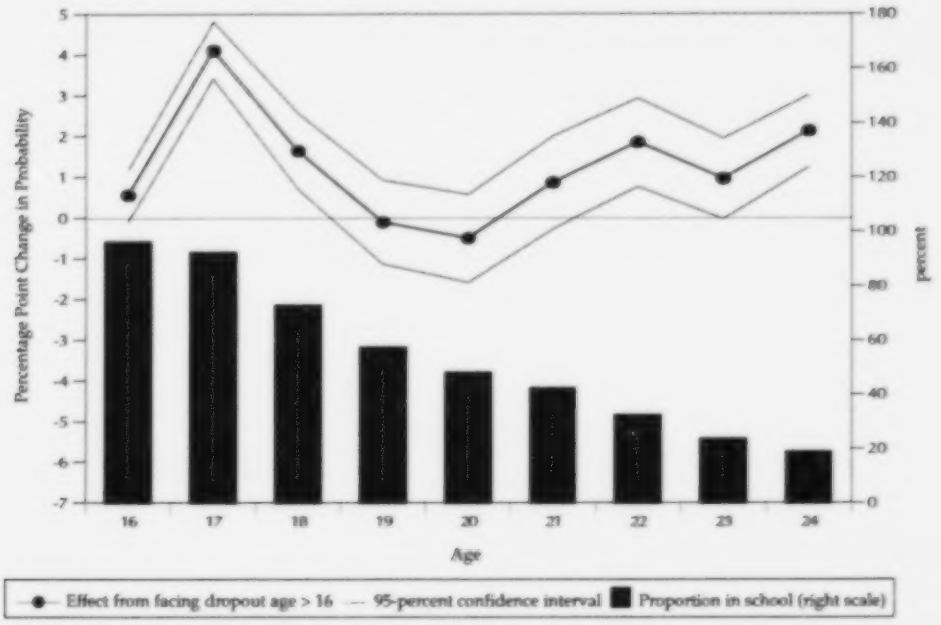
Some of the changes to compulsory schooling laws included so far in the sample occurred in the 1970s and 1980s. Because the effects of these laws may have changed with time, it is useful to restrict the above analysis to the most recent cohorts.

For the most recent cohorts, Figure 3 shows the estimated effect of raising the legal leaving age above 16 on the probability of being enroled in school at different ages. The sample used to construct this figure includes only individuals from the 2000 to 2003 CPS. Each dot in the figure shows the estimated increase in the likelihood of being in school (full-time or part-time) for the corresponding age group. The two thinner lines trace out the 95-percent confidence interval around this estimate. The bars at the bottom of the figure show the average school enrolment in each age group for comparison.

The first dot indicates that an increase in the school-leaving age to above 16 raises the probability of attending school at age 16 by 0.6 percentage points. A stronger influence occurs on the likelihood of attending at age 17 and 18. The attendance rate is 4.1 percentage points higher among 17-year-olds under a school-leaving age above 16, compared to one that is lower. I also estimate some effect on school enrolment in the early twenties, although the large confidence region indicates some uncertainly about the size of these later effects. The evidence lines up with the previous findings above that some individuals may be influenced by high school compulsion to also obtain postsecondary education.

Figure 4 shows the estimated effects from raising the school-leaving age above 16 on specific education-attainment levels. The sample includes only 20- to 24-year-olds in the CPS between 2000 and 2003. The findings are consistent with what effects we might expect the legal leaving age to have on the distribution of education attainment. Within U.S. regions, states with minimum-leaving ages above 16 have fewer individuals whose highest grade attainment lies below Grade 11, and more individuals with Grade 12 and some college education. The compulsory school laws do not influence university graduation, graduate school or professional degree attainment, but this may be because the sample mostly

Figure 3: *Estimated Effects of Minimum School-Leaving Age Above 16 on School Enrolment, 2000 – 2003 Current Population Surveys, Excluding June, July, and August*



Note: Each black dot in the top half of the figure represents a separate regression by age category. An indicator variable for whether an individual is in school was regressed on whether the individual faced a dropout age above 16 in his state of residence when he was 16 years old, plus nine region-fixed effects. The estimated coefficients for the effects of facing a higher dropout age are reported here for each age group. The thinner lines outline the 95-percent confidence interval. The bars in the bottom half of the figure indicate the fraction of sample in each age group in school (right scale).

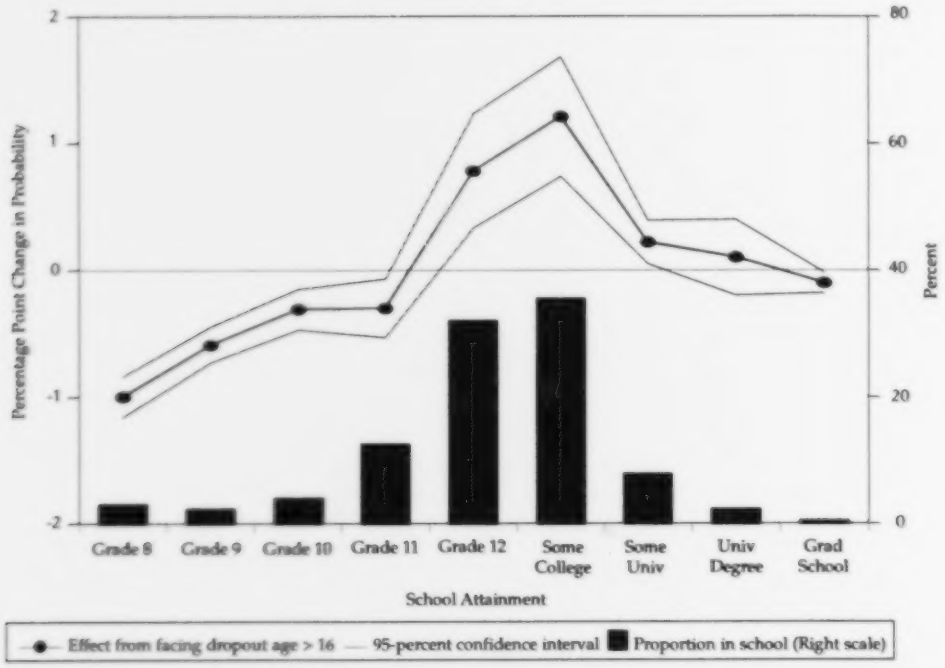
includes individuals in their early twenties who have not yet completed their schooling.

It may not seem surprising that compulsory schooling beyond age 16 increases educational attainment. After all, that is what the policy is meant to do. What's interesting about these findings is that the effects are small, especially considering that a strict interpretation of the law would imply that virtually no teenager would be allowed to leave before age 16. Clearly, this is not the case. The other interesting finding is that the more restrictive compulsory schooling laws also seem to lead to more postsecondary schooling. This effect was not observed in earlier studies (e.g. Acemoglu and Angrist 2001). Postsecondary schooling may seem more achievable from the standpoint of a high-school graduate compared to a high-school dropout.

The Effect of Compulsory Schooling on Subsequent Employment and Wages

Raising school attainment alone, however, does not indicate successful policy. A more important question is what happens to those compelled to stay in school. To answer it, the next section estimates the effects of raising the school-leaving age above 16 on early unemployment and earnings outcomes for 20- to 24-year-olds. I

Figure 4: *Estimated Effects of Minimum School-Leaving Age Above 16 on Grade Attainment, 2000 – 2003 Current Population Surveys, 20- to 24-Year-Olds*



Note: An indicator variable for the school attainment indicated along the x-axis was regressed on whether an individual 20 to 24 years old in the 2000 to 2003 CPS faced a dropout age above 16 in their state of residence when they were 16, plus nine region fixed effects. The estimated coefficients for the effects of facing a higher dropout age are reported here for school attainment level. The thinner lines outline the 95-percent confidence interval. The bars in the bottom half of the figure indicate the fraction of sample in each education level (right scale).

estimate the effects only among those impacted by the changes to law; that is, I estimate whether teenagers compelled to stay in school longer benefit from facing a more restrictive leaving age and, if so, by how much. (The methodology for producing these estimates, as well as detailed results, are found in Appendix B.)

The sample I use here includes all 20- to 24-year-olds in the CPS who were 16 years old between 1970 and 1995. I estimate the effect of compulsory schooling on employment status for everyone in this sample. Because some individuals affected by the law changes may still be in school (at the postsecondary level), I measure the effect of compulsory schooling on weekly earnings only for those in the sample working at least 25 hours per week.

Depending on the specific set of control variables included in the statistical analysis, the results indicate that an additional year of compulsory schooling beyond age 16 has the following effects: it lowers the probability of being unemployed by between 2.5 and 5.6 percentage points (unemployment is defined as not working but looking for work); lowers the probability of not working (irrespective of whether one is looking for work or not) by between 2.7 and 13.3 percentage points; and boosts weekly earnings among those working more than 25

hours per week by between 9.9 and 25.8 percent (detailed results are in Table B2 in Appendix B).

Again, as in the analysis on the effects of school-leaving age laws on education attainment, I repeat the same calculations using the actual dropout age faced by individuals at age 16 as the variable of interest instead of the categorical variable.

The similarities between this second set of estimates and the previous one are striking. They suggest that the impact of a year of compulsory schooling above the age of 16 in the last 30 years is similar to the impact from raising the school-leaving age to 14, 15 or 16 in the earlier part of the 20th century.

Why Not Stay in School?

Finding large gains to individuals from compelling them to stay in school raises the question of why dropouts drop out in the first place. Why do young persons in Canada leave school early if staying on generates attractive gains, on average, to their careers? The possibility that students cannot afford to stay in high school seems unlikely. Many dropouts do not work. Among 16- and 17-year-olds recorded in the 2001 Census as not in school, only 55 percent are in the labour force, and 90 percent still live at home with parents.

Several alternative explanations for dropout behaviour exist. First, dropouts may simply abhor school. Poor classroom performance and condescending attitudes from other students and teachers may make students want to leave as soon as possible, even at the expense of forgoing large returns (Lee and Burkam 2003). Removing reasons for school distaste, in this case, could go a long way in reducing dropout rates. Second, dropouts may be myopic. Myopic students that temporarily downplay or ignore future consequences of their decisions — as considered by Laibson (1997) and O'Donoghue and Rabin (1999) — may prefer dropping out to staying on but later prefer staying on to dropping out. A third alternative is that cultural or peer pressures might dominate adolescent decision making and lead to dropout behaviour. Cultural norms that devalue schooling, a lack of emotional support, or low acceptance for higher education among peers may exacerbate students' distaste for school beyond the minimum (e.g. Akerlof and Kranton 2002; and Coleman 1961). A final consideration is that students may simply mis-predict, underestimating the real expected benefit from staying in school longer. Students' guesses about gains from schooling are often wildly off the mark from those estimated by social scientists (e.g. Dominitz and Manski 2000; and Usher 2005). Teenagers from more disadvantaged family backgrounds are more likely to predict lower gains from additional schooling than those from more affluent families — not just for high school, but higher education as well. Perhaps the main reason why students from low-income households more often dropout or fail to continue on to university is not poverty per se, or debt aversion, but a systematic tendency among this group to overestimate the costs and underestimate the benefits of education.[10]

10 For a more detailed discussion about the implications of these results for explaining dropout behaviour, see Oreopoulos (2005).

Conclusion

This Commentary looks at recent experiences with raising the school-leaving age to 17 and 18 in order to assess the potential benefits for other provinces besides New Brunswick that might do the same. Do such measures serve to decrease high-school dropout rates and improve career outcomes among disadvantaged youths?

I find no change in the relative dropout rate of New Brunswick after it increased the school-leaving age to 18, compared with other Maritime Provinces. I do find small, but significant effects of raising the dropout age in the U.S. An increase in the school-leaving age above 16 increases the total number of years in school by 0.13 years, on average, and decreases high-school dropout rates by about 1.2 percent. I also find that raising the age limit increased postsecondary school attendance by 1.5 percent, even though postsecondary school is not compulsory. Perhaps this finding indicates that would-be dropouts reconsider postsecondary options after getting close to, or completing, a high-school degree.

Exceptions to the law, weak consequences for truancy, or lack of enforcement limit the effectiveness of raising the school-leaving age. But perhaps exceptions are desirable because some students clearly would not benefit from staying on. The results in this paper do not capture whether those students for whom exceptions were made would have gained from being forced to stay. But among students affected, I estimate that additional compulsory schooling significantly improves their early career outcomes by lowering the likelihood of being unemployed and increasing earnings, on average. While the estimates obtained are based on data with a degree of imprecision, which warrants some caution, they are entirely consistent with earlier studies that find significant gains to wealth, health, and other social-economic outcomes from raising the minimum age for leaving school.

If the provinces are serious about making would-be dropouts stay in school longer, they need to effectively enforce these laws while promoting their potential benefits to administrators, parents, and students. While flexibility is prudent to deal with special circumstances, the results here point to a need for more resolve in cases where students begin to disengage from high school. Ideally, compulsory schooling laws would exist in the backdrop, where students don't consider leaving school before the minimum possible age simply because virtually no one does. A temporary increase in enforcement of existing laws might lead to this shift in attitude towards leaving early.

Overall, the results presented here speak favourably to supporting an increase in the school-leaving age to 17 or 18. Raising this age may offer an effective and affordable means to increase education attainment among the least educated and improve their subsequent employment circumstances and earnings potential.

Appendix A: Data

The data for this paper come mostly from the National Bureau of Economic Research's extracts of the Current Population Survey (CPS) outgoing rotation files between 1979 and 2003. The CPS, administered by the U.S. Bureau of Labor Statistics, collects monthly household data about employment and labour markets for about 30,000 nationally representative individuals aged 16. It is the source of the data used to calculate the unemployment rate in the United States. The extract contains variables related to employment, such as hours worked, earnings, industry, occupation, education, and unionization. The extracts also contain many background variables: age, sex, race, ethnicity, and geographic location.

Every household that enters the CPS is interviewed each month for four months, then ignored for eight months, then interviewed again for four more months. In a given month, there are about 120,000 individuals sampled, but only one-fourth of the sample exit the survey and are not interviewed the following month. Usual weekly hours/earning questions are asked only to households in their fourth and eighth interview. Data from these outgoing interviews are combined for every year between 1979 and 2003 to create the extract, for a total sample size over 8.1 million.[11] To examine recent compulsory school-law changes, the base dataset includes only 16- to 24-year olds, who were aged 16 between 1970 and 1995. This restriction cuts the sample down to about 1.2 million.

Some of the variable definitions change from survey to survey and had to be adjusted to make year-to-year comparisons consistent. The years of schooling variable is the highest grade completed plus the number of years of postsecondary school. This variable is recorded in every CPS survey from 1979 to 1992 (the gradeat variable), and is capped at 17. Following Acemoglu and Angrist (2001), I combine this variable with the education categorical variable from the 1992 survey onwards (variable name grade92) by assigning imputed years of schooling to each category for males and females using the imputation method in Park (1994). A high-school dropout is defined as an individual with less than 12 years of schooling. A high-school graduate is defined as an individual with 12 or more years of schooling. An individual in school is defined as an individual reporting in the CPS as being enroled in high school or college in the previous week, excluding surveys taken in the months between June and August. This variable is only available from the CPS since 1984 and for individuals aged 24 or less.

I use the NBER extract's imputed weekly earnings (earnwke), which essentially is actual weekly earnings among those who report it, and reported hourly earnings, times hours worked per week, for individuals who report earnings in hours. Definitions of unemployment (not working but looking for work) and not working come directly from the imputed labour force participation measures of the CPS (ftpt79, ftpt89, ftpt94).

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11 Individuals in these files are interviewed twice, so the combined dataset contains two observations for almost all individuals one year apart. The analysis adjusts for heteroskedasticity from having the same individual in the dataset twice by first aggregating the entire dataset into cells by survey year, birth cohort, gender, and region, and uses Huber-White standard errors clustered at the cohort-region level.

The minimum school-leaving age data come from various years of the National Center for Education Statistics Education Digest. Individuals in the CPS were matched according to the minimum school-leaving age they would have faced at age 16 and assuming an individual's high-school state was the same as her current state of residence. The CPS does not record state of birth.

Much of the main analysis in the paper uses the data collapsed into cell means, aggregated by survey year, birth cohort, state of residence, gender, and race. All regressions and tabulations use either non-institutional population weights or earnings weights, depending on whether the dependent variable uses earnings.

Appendix B: Methodology

Effect of Compulsory Schooling Laws on Educational Attainment

The main regression model to estimate the effects of raising the school-leaving age above 16 is the following:

$$(1)\ EDUC_{iscy} = \lambda\,(DROPAGE_{sc} > 16) + u_s + u_c + u_y + e_{iscy},$$

where $EDUC_{iscy}$ is a measure of education attainment for individual i, living in state s, born in year c, surveyed in year y. The variable $DROPAGE_{sc} > 16$ is equal to one if the individual faced a school-leaving age above 16 when he, or she, was 16 years old in state s. The variable equals zero otherwise, and e_{iscy} is the error term. The regression includes fixed effects for state of residence, birth cohort, and survey year. These variables control for perennial differences in state education attainment that do not vary over time, as well as for national trends in education attainment that do vary over time. I also examine the results with linear birth cohort trends for each state.[12]

The variable of interest, λ, is the average effect of facing a school-leaving age above 16 on educational attainment. Table B1 shows estimates of λ under alternative specifications using the CPS sample of 20- to 24-year-olds who were 16 years old between 1970 and 1995. The first column replaces the state-fixed effects in equation (1) with nine region-fixed effects. The identification of the compulsory schooling effects in this case comes not only from changes in the school-leaving laws, but also from state-to-state variation in the leaving age, within a region. I estimate that, on average, raising the school-leaving age above 16 increases an individual's years of schooling by 0.12 years. Replacing region- with state-fixed effects in column 2 controls for average differences in attainment across states over the entire period. This specification (equation 1) does not significantly change the point estimate, now at 0.13 years. Finally, in column 3, I add state-specific linear cohort trends to examine the possibility the results are driven by state differences in overall education-attainment trends. This cautious specification makes estimation of the compulsory schooling law effect more difficult, since some of the trends may absorb some of the effects. Under this specification, however, we still identify a small effect — 0.16 more years of schooling — from higher school leaving laws.

The second and third rows show the same results, but with high-school completion and postsecondary school enrolment as outcome variables. The results also indicate that raising the school-leaving age above 16 decreases the dropout rate and increases college or university entrance. From the main specification in column 2, raising the school-leaving age above 16 decreases the fraction of 20- to 24-year-olds with less education than a high-school degree by 1.2 percentage points.

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12 The data are first aggregated into cell means at the state, cohort, survey year, gender, and race level, and weighted by cell sample size. The standard-errors reported cluster for state-specific heteroskedasticity using the Huber-White methodology.

Table B1: *The Effects of the Minimum School-Leaving Age on School Attainment for Individuals Aged 20 to 24 Who Were Aged 16 Between 1970 and 1995 — Regression Estimates*

	Faced Dropout Age > 16 at Age 16			Dropout Age Faced at Age 16		
Years of Schooling	0.1177 [0.0208]***	0.1301 [0.0236]***	0.1647 [0.0319]***	0.0681 [0.0094]***	0.0808 [0.0158]***	0.1042 [0.0199]***
Never Completed High School	-0.0164 [0.0033]***	-0.0119 [0.0037]***	-0.0212 [0.0050]***	-0.0155 [0.0014]***	-0.007 [0.0024]***	-0.0132 [0.0028]***
Some College	0.006 [0.0037]	0.0146 [0.0043]***	0.0214 [0.0059]***	-0.003 [0.0019]	0.0082 [0.0028]***	0.0138 [0.0037]***
Cell Size Observations	21555	21555	21555	21555	21555	21555
Region Fixed Effects	Yes	No	No	Yes	No	No
State Fixed Effects	No	Yes	Yes	No	Yes	Yes
Cohort Fixed Effects	Yes	Yes	No	Yes	Yes	No
Survey Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Cohort* State Linear Trend	No	No	Yes	No	No	Yes

Notes: Data are from the NBER's extracts of the Merged Outgoing Rotation Files of the Current Population Survey. The first three columns show results from regressing school attainment on a dummy for whether an individual faced a dropout age greater than 16, plus control variables indicated in the bottom rows. Columns 4 to 6 show results from regressing school attainment on the minimum school-leaving age (16, 17, or 18), plus the control variables. Standard errors are in brackets. The *, ** and *** indicate that an estimate is statistically significant at the 10-, 5- and 1-percent level, respectively. See text for further details.

The second set of results uses the actual school-leaving age as the dependent variable (16, 17, or 18) instead of the dummy variable indicating a school-leaving age above 16 for the main specification. The results are similar.

Some of the compulsory schooling law changes used in the above analysis occurred in the 1970s and 1980s. We can examine the effects of facing a school-leaving age above 16 among the most recent cohorts if we use region-fixed effects instead of state-fixed effects, as we did in column 1 of Table B1. This requires a more restrictive assumption: that within a region (e.g. Pacific, New England), any relationship between the states' education-attainment differences and compulsory schooling-law differences are not driven by other institutional differences related to both. The finding in Table B1 that the estimated effect is very similar, whether we include region- or state-fixed effects, suggests this assumption is reasonable.

Figure 3 (in the main text) shows the estimates of λ for school enrolment status, but using region-fixed effects in equation (1) in place of state-fixed effects. The sample includes only individuals in the 2000 to 2003 CPS. Each dot in the figure shows the estimated increase in the likelihood of being in school (full-time or part-time) for the corresponding age group. The thinner lines trace out the 95-percent confidence interval around this estimate. The bars at the bottom of the figure show the average school enrolment in each age group for comparison.

Figure 4 (in the main text) shows the estimated effects from raising the school-leaving age above 16 on specific levels of educational attainment. The sample

includes only 20- to 24-year-olds in the CPS between 2000 and 2003. The x-axis values correspond roughly to an individual's cumulative years of education. The variable, 'highest education level obtained' was recoded as 8 for eighth grade, 9 for ninth grade, etc. Some college was recoded as 13, a professional degree was recoded as 14, a university degree was recoded as 16, and a graduate degree as 17.

Effect of Compulsory Schooling Laws on Unemployment Rates

To estimate the impact of compulsory schooling for those influenced by these laws (those that would have dropped out sooner), consider the same regression model in equation (1), but using unemployment status as the dependent variable:

$$(2)\ UNEMP_{iscy} = \lambda\,(DROPAGE_{sc} > 16) + u_s + u_c + u_y + e_{iscy},$$

where $UNEMP_{iscy}$ is equal to one if individual i (now older), living in state s, born in year c, surveyed in year y is unemployed, zero otherwise. Equation (2) is known as the reduced-form equation. The coefficient λ captures the average effect of raising the school-leaving age above 16 on the unemployment rate for everyone in the sample. Of course, not everyone is affected by the change in law. What we want to estimate instead is the impact from an increase in the dropout age for those that end up taking one more year of school. For example, suppose the increase in the dropout age makes 50 percent of the population take one more year of school ($\gamma = 0.50$). We can estimate the impact of raising the school-leaving age on those 50 percent by dividing λ by 0.50. If an increase in the dropout age increases total number of school years by 0.50 and an increase in the dropout age decreases average unemployment by 0.02, then we can deduce the effect from taking one more year of compulsory schooling decreases average unemployment by 0.04 (0.02 / 0.50), or λ / γ.

Thus, to estimate the effect of one more year of compulsory schooling (from raising the school-leaving age above 16), we simply rescale our estimate in (2) by the estimated increase in school years in (1). Another way of looking at this is to suppose raising the school-leaving age caused everyone to take one more year of school. Then our estimate in (2) would give us exactly the effect of one more year of school on the likelihood of being unemployed ($\lambda/1$).

For this approach to work, changes in the school-leaving age must be unrelated to changes in state demographic or institutional characteristics that also affect school attainment. Also, if raising the school-leaving age does not affect an individual's education attainment (e.g. whether facing a dropout age of 16 or 18, she intends to graduate), raising it also does not affect her unemployment rate. Another way to describe this instrumental variables method is in two stages. In the first stage, we estimate education attainment differences caused only by changes in the school-leaving age (the first stage is equation (1)). In the second stage, we estimate:

$$(3)\ UNEMP_{iscy} = \beta\, EDUC_HAT_{iscy} + v_s + v_c + v_y + e_{iscy},$$

Table B2: *The Effects of Compulsory Schooling on Unemployment and Earnings for Individuals Aged 20 to 24 Who Were Aged 16 Between 1970 and 1995 – Second-Stage IV-Regression Estimates*

	Faced Dropout Age > 16 at Age 16			Dropout Age Faced at Age 16		
Unemployed	-0.025 [0.0139]*	-0.0378 [0.0160]**	-0.0561 [0.0163]***	-0.0278 [0.0104]***	-0.0253 [0.0138]*	-0.0504 [0.0147]***
Not Working	-0.1326 [0.0318]***	-0.0435 [0.0232]*	-0.0268 [0.0185]	-0.1356 [0.0256]***	-0.0236 [0.0222]	-0.0227 [0.0174]
Log Weekly Earnings for those working > 25 hrs/week	0.099 [0.0533]*	0.1328 [0.0757]*	0.2582 [0.0385]***	-0.0473 [0.0385]	0.0764 [0.0672]	0.2151 [0.0637]***
Cell Size Observations	21555	21555	21555	21555	21555	21555
Region Fixed Effects	Yes	No	No	Yes	No	No
State Fixed Effects	No	Yes	Yes	No	Yes	Yes
Cohort Fixed Effects	Yes	Yes	No	Yes	Yes	No
Survey Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Cohort* State Linear Trend	No	No	Yes	No	No	Yes

Notes: Data are from the NBER's extracts of the Merged Outgoing Rotation Files of the Current Population Survey. Standard errors are in brackets. The *, ** and *** indicate that an estimate is statistically significant at the 10-, 5- and 1-percent level respectively. See text for further details.

where $EDUC_HAT_{iscy}$ is an individual's predicted education based on the first stage. The coefficient β is the average effect from one year of education, caused from a change in the compulsory school-leaving age. It is equivalent to λ / γ.

Table B2 shows estimates of the effects of a year of compulsory schooling on early career outcomes. The first three columns look at the effects of compulsory schooling when the school-leaving age is raised above 16. The last three columns use the actual dropout age faced as the independent variable of interest. The sample includes all 20- to 24-year olds in the CPS that were 16 years old between 1970 and 1995. I estimate the effect of compulsory schooling on unemployment and employment status for everyone in this sample. Because some individuals affected by the law changes may still be in school (at the postsecondary level), I measure the effect of compulsory schooling on weekly earnings only for those in the sample working at least 25 hours per week.

Column 1 shows the results using region-fixed effects instead of state-fixed effects. This specification lets us estimate the effects of compulsory schooling using cross-section variation in state laws, but requires the assumption that this within-region variation is not related to other factors that could explain education or labour market outcome differences. The table indicates that an additional year of compulsory schooling, caused from increasing the school-leaving age above 16, lowers the likelihood of unemployment by 2.5 percentage points (unemployment is defined as not working but looking for work). The confidence interval around this estimate is wide, but the estimate is statistically significant at the 10-percent level. The effect on the likelihood of working at all for this age group is quite

large, but imprecisely estimated. Perhaps most interestingly, the return to compulsory schooling on weekly earnings is 9.9 percent, an estimate not much different from earlier studies that use older birth cohorts. An additional year of compulsory schooling is associated with about 10-percent higher weekly earnings among those working more than 25 hours per week.

Column 2 shows the main results that include state-fixed effects, so that identification of the effects of compulsory schooling comes only from changes in the minimum school-leaving age. I estimate that a year of compulsory schooling from these law changes decreases the probability of being unemployed by 3.8 percentage points and decreases the probability of not working by 4.4 percentage points. The extra year also increases weekly earnings by an average of 13.3 percent.

Column 3 shows results from estimating the model that allows for underlying linear birth-cohort trends for each state. This specification makes the assumption required for causal interpretation of the results more likely, but at the expense of possibly absorbing variation driven by the school-leaving ages and making the estimates less precise. Nevertheless, with this model, the estimates for the effects of compulsory schooling on unemployment and not working are similar to those in column 2, and the effects on weekly earnings are greater.

Columns 4 to 6 show the same estimates but using the actual dropout age faced by individuals at age 16 as the instrumental variable in equation (1).

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